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Non Invasive Imaging

EVALUATION OF CIRCUMFERENTIAL AND LONGITUDINAL STRAIN IN A RABBIT FETAL HEART MODEL USING 4D ECHOCARDIOGRAPHY

Poster Contributions
Hall C
Sunday, March 30, 2014, 3:45 p.m.-4:30 p.m.

Session Title: Non Invasive Imaging: Myocardial Strain, Cardiac Mechanics and Diastolic Function
Abstract Category: 15. Non Invasive Imaging: Echo
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Background: Strain determination in fetal hearts could provide important clinical information. We tested a new non-gated 4D echocardiography method for accuracy in strain computation.

Methods: Fifteen rabbit hearts were studied. Each heart was mounted in a water tank to facilitate ultrasound scanning, connected to a calibrated pump by a balloon sutured into the left ventricle (LV), and pumped at stroke volumes (SV) 1-5 ml and stroke rates (SR) 40 and 80 bpm. Three 0.7mm sonomicrometry crystals were secured within the myocardium to record longitudinal and circumferential strain measurements. At each SV and each SR, 4D images were obtained by an X6-1 probe on a Philips iU22 ultrasound system while sonomicrometry displacement was recorded. This process was done before and after a simulated myocardial infarction (MI). 4D images were analyzed offline for strain by a MatLab-based program.

Results: Data collected on the Philips ultrasound system correlated with sonomicrometry derived strain at each SV (CS: $R^2 = 0.91$, $p<0.05$; LS: $R^2 = 0.87$, $p<0.05$). A decrease in strain post-MI was detected by both echocardiography and sonomicrometry.

Conclusions: Non-gated 4D echocardiography is a feasible method for strain determination of fetal hearts.